Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

careful citation, admirable descriptions, host lists, etc., as well as the synoptic keys to the families, the genera, and the species, are all to be most highly commended.

This publication deals with minute plants and as has been well said they must be studied with a corresponding minutia. We may regret it but it was inevitable — the simplicity of the old order of things has disappeared. To know the Rusts is to know their life histories, their spore forms, the structure of the sorus, and the various morphological characters — all of which, together with apparent phylogenetic relationships, have been employed by the author in constructing this exhaustive monograph, epoch making and destined to become classic.

AN APPLE ROT DUE TO VOLUTELLA.

F. L. STEVENS AND J. G. HALL.
N. C. Agr. Exp. Station.

A black rot of apples closely imitating in appearance that caused by Sphaeropsis, but differing from the sphaeropsis rot in several details, has been observed frequently in various sections of this State, on native apples and on apples shipped into the State from a distance.

In general appearance the disease consists of a rotten black spot upon the fruit. The central and older portions of the decayed region are of an intense coal black color. The younger region of the spot, its outer border, a zone about 14 mm. in width, is brownish.

Close inspection reveals the presence of slightly elevated pimple-like places in the cuticle. These are found to within 3 or 4 mm. of the edge of the spot, and become larger and more pronounced as the center of the spot is approached. Indeed the black color of the spot is due to the thick setting of these black pimples all over its surface. In many instances unless the spot be very old no other development is seen, and the disease might readily be considered to be the ordinary black rot caused by Sphaeropsis, and doubtless often passes for it. In older spots however, the pimples are seen to have broken through the cuticle of the apple, and each pimple appears as a small wart-like excresence, and a good lens shows that it is thickly beset with stiff black hairs. These hairs constitute the distinctive character of this disease, and serve to separate it with ease and certainty from the Sphaeropsis rot, provided the rot has developed far enough to exhibit this character.

On slicing the apple open it is seen that the zone most recently invaded is brownish, while all the older portion is black.

While the decayed portions are softer than the healthy, this is in no sense a wet rot, the softness being due to a spongy dryness rather than to a watery dissolution. Upon microscopic examination the cells of the old, dark, diseased portion of the apple are found to be filled with a tangled mass of black or dark brown fungous threads which are richly septate and much branched (Fig. 1). In thickness they vary from 5 to 7 μ in the older portions. In the newly invaded cells the mycelium is usually only about 2 μ thick and is colorless.

As the spot ages the mycelium develops more abundantly in a few layers of cells next to the cuticle, particularly immediately under the cuticle. From this sub-cuticular layer of tangled mycelium there develops a cushion of hyphae which are arranged parallel and stand upright, perpendicular to the substratum. These hyphae are quite uniform in thickness and regular in arrangement, composed of short, rectangular cells (Fig. 2). These upright hyphae increase in length, rupture the cuticle and develop the tubercular mass, "sporodochium," characteristic of the order Tuberculariales. The sporodochia attain a height of 100 to 125 μ and a diameter nearly twice as great. About midway from base to top of the sporodochium the hyphae become narrower and the setae have their insertion. The setae develop directly from hyphae which stand amid sporophores and are indistinguishable from them, their only point of difference being that the setigerous hyphae broaden out at the end and develop into typical setae while the sporogenous proceed to spore development. Each setum is produced from the tip of a single hypha (Fig. 3). The setae are from 100 to 400 μ long, tapering from the base to tip. At base they are 5 to 8 μ broad and bear from 2 to 5 septae (Fig. 4).

At the upper end of the erect fuscous or black hyphae, which constitute the sporodochium is a simple, slender hyaline stalk "condiophore" from 25 to 35 μ by 3 μ which bears the spore. The conidiophores together constitute the outermost layer of the sporodochium. The spores are produced acrogenously, being cut off from the tips of the conidiophore by constriction of the fertile hyphae.

The spores are oblong-fusoid to falcate-fusoid with acute ends (Fig. 5) hyaline or very slightly olivaceous, continuous, though with the low power of the microscope they often appear uniseptate owing to peculiarities of the protoplasm in this region. They measure from 17 to 23 μ long by 2.5 to 3.5 μ broad.

Placed in apple agar in hanging drop cultures they germinate in about three hours; at first by a single hyphal thread near one end of the spore, but later other points of germination can be seen. When germination begins the spores become very coarsely granular. The granules become fewer in number and larger as germination proceeds. Later by the migration of the granules into the young hyphae clear spaces appear. Often the end of the germ tube swells, becomes cut off by a wall and rapidly assumes a dark color and, in general, takes on the appearance of the black bodies which are so characteristic a feature in the germination of the anthacnoses. As with the anthracnoses this body may remain without further development or it may germinate immediately (Fig. 6).

There has been much doubt as to the true nature of these structures. Frank[1] regarded them as holdfasts to assist in securing penetration into the host. Hasselbring[2] as the result of recent investigation regards them in he same light. Other writers have variously considered them as spores, secondary spores, buds, gemmae chlamydospores, etc. References to the literature regarding these bodies is to be found in Hasselbring's article.

These structures have been described for Colletotrichum and Gleosporium, one of the authors of this paper having studied them in some twenty-five species from these two genera,[3] in Polystigma, Fusicladium and Volutella.[4]

Transfers into solidified pea agar and apple agar plates were made under aseptic conditions from the regions immediately beneath the skin in a diseased spot, also from the diseased tissue near the boundary between diseased and healthy portions, and in every instance pure cultures of the fungus were obtained. Pure cultures were also obtained by plating from water containing the spores of the fungus.

Grown upon plain agar or pea agar the mycelium was hyaline with many black tubercles; on agar containing carbohydrates as starch or sugar the mycelium was densely black.

In none of the cultures upon artificial media were spores formed. On sterilized apple twigs, however, spores were formed in great abundance. The mycelium on this medium was at most only slightly fuscous and was in most cases hyaline.

Inoculations were made from mycelium grown in pure cultures by pricking the skin of an apple and laying on, or inserting, a bit of the mycelium. Within a few days a well developed spot was obtained.

Many attempts were made to secure inoculations through unbroken cuticle but in no instance with success. It is evident that a bruise or break of some kind is necessary. This evidence correlates well with the fact that the disease, as is true of so many fruit diseases, is much more common at the blossom end, or the stem end, than at other points. The rot occurs at either end of the fruit more often than elsewhere, because it is at these places that the cuticle is most liable to injury.

---

[1] Ueber einige neue und weniger bekannte Pflanzenkrankheiten. Ber. Deut. Bot. Ges. I: 29-34, 58-63. 1883.

[2] The Appressoria of the Anthacnoses Bot. Gaz. 42, 135.

[3] See article by Halsted: The Secondary Spore in Anthracnoses, N. J., Agr. Experiment Station Report. 1892, 203.

[4] Stoneman, A Comparative Study of Some Anthracnoses, Bot. Gaz. 26: 69, 1898. Plate 13, fig. 82 and Plate 14, fig. 86.

The tubercular development places the fungus unquestionably among the Tuberculariales. Further the road is not so clear. Judging strictly from the color of the mycelium it must go to the Dematiae, but a glance over its possible kin there reveals none which are of certain affinity. Admitting that it is possibly a Mucedineae, it clearly must belong to the genus Volutella. This genus is made up mainly of light colored fungi, though several of the genus are very dark, notably *V. Acalyphae, oxyspora, Violae, Citrulli* and *Allii.* From a structural viewpoint this fungus seems much closer to Volutella than to any of the Dematiae. In view of the purely physiological nature of the color character, as shown by our cultures, it being dependent upon the presence of carbohydrates — which is present in abundance in the natural medium of the apple — we believe we are doing no violence to facts in placing it in the genus Volutella.

As a Volutella it stands closest to the species named above, yet is distinct enough from them to be regarded as a separate species for which a description is herewith proposed.

It differs from oxyspora in larger sporodochium, 150-400 μ and longer setae, shorter spores and longer basidia; from Citrulli in shape of spores; from Allii, sporodochia larger not convex or elongate, setae longer; from Violae in character of sporodochium, see Bot. Gaz. 26:85, Pl. XIV; from Acalyphae in size of spores.

Volutella fructi Stevens & Hall n. sp.

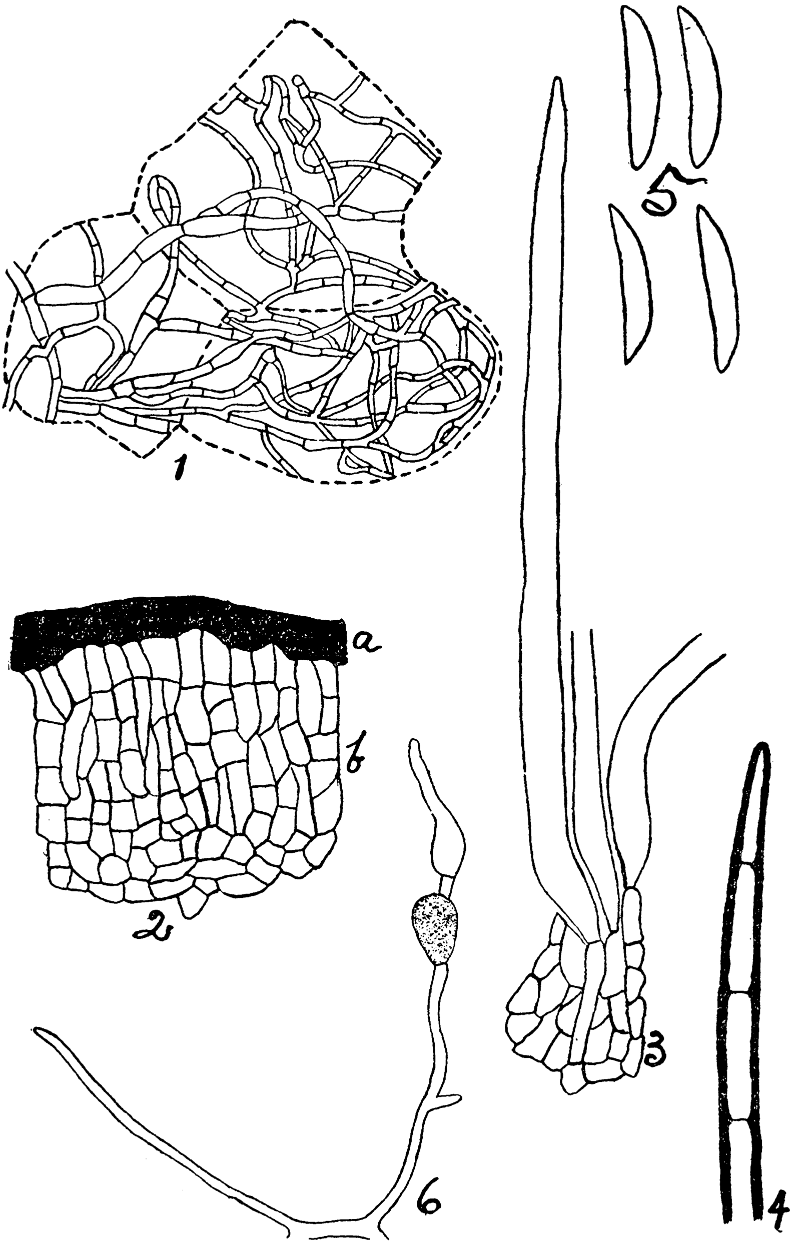
Sporodochia numerous in concentric circles, early subcuticular then erumpent, elevated, black, 150-400 μ diameter; mycelium, black in presence of carbohydrates, otherwise hyaline. Setae; distributed throughout sporodochium, black 0-5 septate, acute, smooth, 100-400 μ long, 5 to 8 μ thick. Sporophores; elongate, hyaline, simple, 25-35 by 3 μ. Conidia; hyaline or very slightly olivaceous, continuous, smooth, oblong-fusoid to falcate-fusoid 17 to 23 by 2.5 to 3.5 μ.

Habitat: fruit of *Pyrus Malus.* North Carolina, type N. C. Agr. Experiment Station No. 780.

EXPLANATION OF FIGURES.

FIG. 1. Three apple cells invaded by the mycelium of Volutella.

FIG. 2. Showing early stages in the development of the sporodochium before the rupture of the cuticle. (a) Cuticle of the apple; (b) Columnar arrangement of the fungous hyphae.



VOLUTELLA FRUCTI.

FIG. 3. Showing origin of setum from a single hypha.
FIG. 4. Portion of setum showing septae.
FIG. 5. Spores.
FIG. 6. A germinated spore (a); showing also one of the appressoria (b).

FUNGI SELECTI GUATEMALENSES. EXSICCATI DECADE II.*

W. A. KELLERMAN.

In this decade specimens of three new species (recently described in the Journal of Mycology) are presented, namely Aecidium byrsonimae Kern & Kellerman, Puccinia heliotropii Kern & Kellerman, and Uredo trixitis Kern & Kellerman; also species on heretofore unreported hosts are shown, as well as specimens exhibiting an extended range of the fungus. The species and their hosts are as follows:

11. Aecidium byrsonimae Kern and Kellerman on Byrsonima crassifolia (L.) H. B. K.
12. Balansia trinitensis Cooke & Massee on Panicum sp. indet.
13. Coleosporium plumierae Patouillard on Plumiera rubra L.
14. Puccinia conoclinii Seymour on Eupatorium rafaelense Coulter.
15. Puccinia heliotropii Kern and Kellerman on Heliotropium indicum L.
16. Puccinia purpurea Cooke on Sorghum vulgare Pers.
17. Puccinia tetramerii Seymour on Blechum brownei Juss.
18. Puccinia tithoniae Dietel & Holway on Tithonia tubaeformis Cass.
19. Uredo biocellata Arthur on Pluchea odorata Cass.
20. Uredo trixitis Kern and Kellerman on Trixitis frutescens P. Br.

11. Aecidium byrsonimae Kern & Kellerman

On Byrsonima crassifolia (L.) H. B. K.

Sierra de las Minas (Departamento Baja Verapaz), opposite El Rancho, alt. 615 m. 2050 ft.) Guatemala, C. A.
March 10, 1905.
W. A. Kellerman, No. 4325.

The published note concerning this Aecidium by Mr. Kern is as follows: An interesting species because of the hypertrophy it produces,

---

*Contributions to Guatemalan Mycology. V.